PROTOCOL

of the Second Sessions of the Joint US-USSR
Working Group on Electrometallurgy

I. Introduction

1. The second session of the Joint US-USSR Working Group on Electrometallurgy was held in the U.S. from May 19 to June 2, 1974, for discussion and approval of appropriate projects and forms of cooperation under the general topics approved for priority implementation by the Joint US-USSR Commission on Scientific and Technical Cooperation at its meeting in Moscow, November 28 and 29, 1973.

2. The general topics approved by the Joint Commission are, briefly, as follows, and were based on the negotiations by the Joint Working Group at its first meeting in USSR, October 29 to November 2, 1973:

   a. electroslag technology

   b. plasma-arc melting of metallic materials

   c. electron beam deposition of metallic and non-metallic materials in vacuum

   d. research and development of new welding materials

3. The composition of the Joint Working Group participating in the work on both sides is given in Appendix 1. The individuals in U.S. and USSR responsible for coordinating joint cooperation in each of the areas are listed in Appendix 2.

4. The detailed itinerary of the Soviet Delegation is given in Appendix 3. The Joint Working Group met in Washington May 20 and 21 to discuss the themes in general and to prepare preliminary drafts of the projects. From May 22 to May 29, the Soviet Delegation, accompanied by representatives of the U.S. Group, visited laboratories of industry, universities and government to discuss the preliminary drafts in greater detail with the prospective U.S. cooperative sources. On May 30 and 31 the Joint Working Group met in Washington to review problems and other details and to finalize the project details. People contacted during the above visits are listed in the Appendix 4.

5. Both sides note the considerable interest by all concerned expressed in the projects finally developed, and the absence of disagreements.

Declassified in Part - Sanitized Copy Approved for Release 2013/05/07 : CIA-RDP79-00798A000300060006-3

II. Agreements

1. Working under the above four general headings, both sides agreed on projects as described in Appendices 5, 6, 7, and 8. These appendices describe the type of the work and individual stages, the implementing organizations and personnel from each side, the projected time frames for initiating and completing the various stages of the work, and the forms of their implementation and reporting. The general time frame is 1974 through 1976, with every effort to initiate and complete the work as expeditiously as possible. The U.S. emphasized the need for recognizing that the proposed implementations were subject to the availability of funds and to final agreements with the listed implementing organizations. Action to initiate necessary arrangements would begin promptly.

2. In addition to the above projects, the sides agreed to expand the joint cooperation and to prepare drafts of joint programs on the following topics: evaluate the technological characteristics, such as engineering properties, of the materials or products resulting from this work, their quality, homogeneity, reproducibility and reliability (U.S. proposal). This would be accomplished primarily by exchange of material and mutually agreed testing and evaluating procedures. The sides agreed that a program of joint work on "joining materials in the solid state", proposed by the U.S., would be developed for submittal to the Joint Commission at its third meeting. (A description of this topic is given in Appendix 9).

3. It was agreed to consider further an exchange of students, trainees and research workers, with the aim of initiating such an exchange in 1975. Approximately 12 man-months on each side was envisioned.

4. It was agreed that, for the purpose of determining other technical details where necessary and for discussing the results of work accomplished and for information exchange, there would be a mutual exchange of Task Forces and implementing groups in 1974-1976, as appropriate. Details of these exchange visits would be worked out at a working level.

5. It was agreed that the Joint US-USSR Working Group would meet in USSR in April-May, 1975, to review progress and any problems that might have arisen, and to do further planning.

6. It will be noted that the forms of cooperation include a broad spectrum, from specific research through symposia.

III. This Record was composed in English and Russian in Washington, D. C. and signed on May 31, 1974. Both texts are equally authentic.

N. E. Promisel

Chairman of the US part of the US-USSR Working Group
N. E. Promisel

Chairman of the Soviet part of US-USSR Working Group,
Doctor of Technical Sciences
S. Antonov

Appendix 1

LIST OF PARTICIPANTS IN THE
SECOND MEETING OF THE JOINT U.S.-U.S.S.R.
WORKING GROUP ON ELECTROMETALLURGY

From the U.S.

N. E. Promisel	- Chairman of U.S. Working Group, Formerly Executive Director, National Materials Advisory Board, National Academy of Sciences
R.A. Beall	- Research Supervisor, U.S.Bureau of Mines, Department of the Interior
M. C. Flemings, Jr.	- Professor of Metallurgy and Materials Science, Massachusetts Institute of Technology
R. W. Hall	- Asst. Chief, Materials and Structures Div., NASA Lewis Research Center
R. W. Heckel	- Professor of Metallurgy and Materials Science and Head of Department, Carnegie-Mellon University
I. A. Oehler	- Chairman of the Board, American Welding and Manufacturing Co.
W. F. Savage	- Professor and Director of Welding Research, Rensselaer Polytechnic Institute
L. J. Swartzenruber	- Metallurgist, Alloy Physics Section, Metallurgy Div., National Bureau of Standards
A. Van Echo	- Deputy Branch Chief, Fuels and Materials, U.S. Atomic Energy Commission
R. J. Wasilewski	- Section Head, Materials Research Laboratories, National Science Foundation
T. Watmough	- Assistant Director, Materials Research, IIT Research Institute

From the U.S.S.R.

S. P. Antonov	-	Chairman of U.S.S.R. Working Group Doctor of Technical Sciences Division Chief, State Committee for Science and Technology of the U.S.S.R. Council of Ministers
B. A. Movchan	-	Division Chief, E. O. Paton Institute of Electrowelding Corresponding Member of the Uk.S.S.R. Academy of Sciences
P. P. Menushenkov	-	Chief, Glavspetsstal' Ministry of Ferrous Metallurgy of the U.S.S.R.
I. K. Pokhodnya	-	Senior Scientific Secretary, Presidium of the Uk.S.S.R. Academy of Sciences Corresponding Member of the Uk.S.S.R. Academy of Sciences
V. I. Kashin	-	Candidate of Technical Sciences Deputy Director, Institute of Metallurgy of the U.S.S.R. Academy of Sciences
L. V. Kovalenko	-	Candidate of Technical Sciences Senior Expert, State Committee for Science and Technology of the U.S.S.R. Council of Ministers
G. M. Grigorenko	-	Candidate of Technical Sciences Senior Researcher, E. O. Paton Institute of Electrowelding
S. A. Fomina	-	Senior Engineer, E. O. Paton Institute of Electrowelding
D. D. Inashvili	-	Senior Engineer, State Committee for Science and Technology of the U.S.S.R. Council of Ministers

Appendix 2

NAME OF TOPIC	RESPONSIBLE FOR TOPIC IN THE USSR	RESPONSIBLE FOR TOPIC IN THE USA
1. Electroslag technology	Prof. B. T. Medovar E.O. Paton Welding Institute Kiev - GSP150 Gorky St. 69, USSR Phone: 61-53-18	Dr. M.C. Flemings,Jr. Professor of Metallurgy and Materials Science, Massachusetts Institute of Technology Cambridge, Mass. 02139,USA Phone:617 253-1000 x3234
2. Vacuum electron beam deposition of metallic and non-metallic materials	Prof. B. A. Movchan E. O. Paton Welding Institute Kiev - GSP150 Gorky St. 69,USSR Phone: 61-53-18	Dr. R.A. Beall Research Supervisor U.S. Bureau of Mines Department of the Interior Albany, Oregon, USA Phone: 503 926-5811 x215
3. Plasma-arc melting of metallic materials	Prof. V. T. Lakomsky E.O. Paton Welding Institute Kiev - GSP150 Gorky St. 69, USSR Phone: 61-53-18	Dr. R. J. Wasilewski Head, M.R.L. Section Division of Materials Research National Science Foundation Washington, D.C. 20550,USA Phone: 202 632-7408
4. Investigation and development of new welding materials for general and special applications	Prof. T. K. Pohodnya E.O. Paton Welding Institute Kiev - GSP150 Gorky St. 69, USSR Phone: 61-53-18	Dr. W. F. Savage Professor and Director of Welding Research Rensselaer Polytechnic Institute Troy, New York 12180,USA Phone: 518 270-6448

NAME OF TOPIC	RESPONSIBLE FOR TOPIC IN THE USSR	RESPONSIBLE FOR TOPIC IN THE USA
Chairman	S.P. Antonov State Committee on Science and Technology Gorky St. 11 Moscow, USSR Phone: 229-22-36 229-20-00 Telex: 7241 MSK	Nathan E. Promisel Executive Director (Emeritus) of the National Materials Advisory Board National Academy of Sciences 12519 Davan Dr. Silver Spring, Md. 20904,USA Phone: 301 622-3426 Telex 710 822 9589

Appendix 3

ITINERARY AND GENERAL AGENDA FOR
USSR WORKING GROUP ON ELECTROMETALLURGY

Sunday, May 19:

Arrive New York and Washington (Roger Smith Hotel).

Monday & Tuesday, May 20 & 21:

Joint Working Group discussions in Washington (Room 544, National Science Foundation, 1800 G Street, N.W.). Review of previous activities and topics, discussion of agenda and itinerary, preparation of preliminary drafts of programs. Leave for Chicago, 1730 hours.,

Wednesday, May 22:

Visit IIT Research Institute in Chicago. Tour laboratories. Technical discussions. Leave for Portland, Oregon, 1830 hours.

Thursday, May 23:

Visit Oregon Graduate Center in the morning and the laboratories of the U.S. Bureau of Mines, Oregon Metallurgical Corp. and REM, Inc. in the afternoon (group splits for latter two). Meeting at Bureau of Mines will include discussions with representatives from: Oregon Metallurgical Coporation, TiLine, Zirconium Technology, REM, Inc., Teledyne Wah Chang. Leave for San Francisco 1810 hours.

Friday, May 24:

Visit and tour Airco/Temescal, Berkeley, California and Airco/Vacuum Metals. Technical discussions including Prof. Bunshah, UCLA.

Saturday and Sunday, May 25-26

Open period for relaxing and sightseeing in San Francisco area.

Monday, May 27:

Travel to Boston, Massachusetts, 1230 hours.

U.S. National Holiday. Open period for sightseeing with possibly some contacts with Massachusetts Institute of Technology.

Tuesday, May 28:

Visit and tour Massachusetts Institute of Technology (MIT). Technical discussions including Manlabs, Inc.

Wednesday, May 29:

Group splits. Group 1 departs 0700 hours for visit to Rensselaer Polytechnic Institute, Troy, New York, and GE Lab., Schenectady, N.Y. Discussions include industry representatives (see Appendix 4). Group 2 visits Carnegie-Mellon Institute in Pittsburgh, Pennsylvania and Universal-Cyclops Steel Division, Bridgeville, Pennsylvania.

In the evening, entire USSR Group returns to Washington (Roger Smith Hotel).

Thursday & Friday, May 30 & 31:

Discussions of specific agreements in Washington (Meeting Room 544, National Science Foundation, 1800 G Street, N.W.). Finalizing and signing of documents. Leave for N.Y. 1900 hours.

Saturday, June 1:

Open day for relaxing and sightseeing in N.Y.

Sunday, June 2:

Depart for Moscow.

APPENDIX 4

MAIN PERSONS PRESENT FOR DISCUSSION AT PLACES VISITED

(In the order indicated in Itinerary, Appendix 3)

IIT Research Institute, Chicago, Illinois

Dr. N. M. Parikh; Director, Metals Research Division
Dr. R. E. Beale; Assistant Director, Metals Research Division
Dr. E. Bangs; Senior Metallurgist, Metals Research Division
Dr. F. C. Bock; Scientific Advisor, Computer Sciences
Dr. K. Kulkarni; Manager, Metalworking Research

Oregon Graduate Center, Portland, Oregon

Dr. R. Kerr; Vice President
Dr. Wm. Wood; Researcher in Ferrous Materials
Dr. Niak; Researcher in Hard Materials

U.S. Bureau of Mines, Department of Interior, Albany, Oregon

Dr. R. A. Beall; Member, U.S. Working Group
Dr. E. D. Calvert; Metallurgist
Dr. R. H. Nafziger; Physical Chemist
Dr. C. E. Armantrout; Metallurgist

Oregon Metallurgical Corp., Albany, Oregon

Dr. Frank Caputo; Vice President

REM, Inc., Albany, Oregon

Mr. Robert Lee; President
Mr. Richard Humphrey; Metallurgist

Rensselaer Polytechnic Institute, Troy, New York

Prof. W. F. Savage; Member, U.S. Working Group
Mr. W. T. Delong; Vice President, Teledyne McKay, York, Pennsylvania
Mr. R. K. Lee; Vice President, Welding Products Division, Chemetron Corp., Hanover, Pennsylvania
Mr. J. E. Norcross; Executive Vice President, Arcos Corp., Philadelphia, Pennsylvania
Dr. A. Lesnewich; Director of Filler Metals Research and Development Department, Airco Welding Products, Murray Hill, New Jersey
Mr. P. Patriarca; Manager, LMFBR Development Programs, Oak Ridge National Laboratories, Oak Ridge, Tennessee

General Electric Corp., Schenectady, New York

Mr. R. I. Christoffel; Mangerof Welding Division, Materials and Processing Laboratory
Dr. J. L. Van Ullen; Manager, Mechanical Engineering, Materials and Processing Laboratory
Mr. C. H. Kreischer; Engineer, Materials and Processing Laboratory
Mr. D. L. Newhouse; Managerof Forging Division, Materials and Processing Laboratory
Mr. L. Kennebeck; Engineer, Generator Department

Carnegie-Mellon University, Pittsburgh, Pennsylvania

Dr. H. L. Toor; Dean, College of Engineering
Prof. R. W. Heckel; Member, U.S. Working Group
Prof. C. L. Bauer; Director, Center for Joining of Materials
Prof. R. F. Sekerka; Member, Center for Joining of Materials
Prof. L. F. Vassamillet; Member, Center for Joining of Materials
Prof. I. M. Bernstein; Member, Center for Joining of Materials

Universal-Cyclops Specialty Steel Division, Bridgeville, Pennsylvania

Dr. F. M. Richmond; Vice President and Technical Director
Mr. L. W. Lherbier; Manager of Research
Mr. P. L. Lansing; Manager of Process Dvelopment
Mr. L. G. Joseph; Superintendent, Melting Operations
Mr. R. J. Steinman, Jr.; Melting Metallurgist

Whitteker TiLine, Albany, Oregon

Mr. Fred Tiefke; Metallurgist

Zisconium Technology, Albany, Oregon

Mr. Henry Sharpe; Chairman of the Board

Teledyne Wah Chang, Albany, Oregon

Mr. Ralph Neilson; Chemist

Airco/Temescal Corp., Berkeley, California

Dr. B. Badenock; President
Dr. E. Gregory; Director, Corporate Research and Development (Airco)
Dr. R. Hill, Director Research and Development (Temescal)
Dr. R. Wasilewski; (National Science Foundation) Member, U.S. Working Group
Dr. C. Hunt; Consultant to Temescal
K. Kennedy)
G. Stephan) Technical Staff
R. Fountain)
J. Lowe)
Also present, Prof. R. Bunshah, University of California, Los Angeles

Airco/Vacuum Metals, Berkeley, California

John Longfeldt

Massachusetts Institute of Technology, Cambridge Massachusetts

Prof. M. C. Flemings; Member, U.S. Working Group
Prof. T. B. King
Prof. R. Mehrabian
Prof. J. F. Elliott
Prof. N. J. Grant
Prof. K. Masubuchi
Also present, Dr. A. Kulin; President, Manlabs, Inc.

Appendix 5

PROGRAM OF THE US-SOVIET SCIENTIFIC AND TECHNICAL COOPERATION IN THE FIELD OF ELECTROSLAG TECHNOLOGY

No.	Project Titles	Contents of Projects	Cooperating Organizations		Projected Dates		Form of Implementation of Work	Form of Cooperation
			USSR	USA	Begin	End		
1	2	3	4	5	6	7	8	9
1.	Study of thermophysical and [illegible] processes in electroslag technology	1. Study of reactions, slag-metal and gas-metal in electroslag processes		MIT, (Prof. J. F. Elliott, Prof. T. B. King)	1974	1976	Tables, graphics, nomographs, reports, articles	1. Conduct of research independently by each side. 2. Exchange of experimental methodology, material, and samples 3. Joint seminars and meetings to discuss results
		2. Study of current and electrical resistance distribution in the slag bath	Paton Institute of Electric Welding (Prof. B. I. Medovar)					
		3. Study of heat flow and convection, special features of crystallization of ingots in electroslag remelting in: (a) laboratory installation (b) industrial equipment	Paton Institute of Electric Welding (Prof. B. I. Medovar) Central Scientific Research Institute of Ferrous Metallurgy, (Prof. A. G. Shalimov)	Cabot Corp., (Dr. J.Klein)	1974	1976		
2.	Mathematical modelling of electroslag technology	1. Modelling of thermal and fluid flow in liquid slag and transport of metal through fluid slag in electroslag remelting	Paton Institute (Prof. B. I. Medovar, Dr. Yu. A. Sterenbogen)	Univ. of Buffalo (Prof. J. Szekely)	1974	1976	"	"
		2. Modelling of thermal and fluid flow [illegible]	"	" MIT, (Prof. [illegible]	1974	1976		

UNCLASSIFIED

No.	Project Titles	Content of Projects	Cooperating Organizations		Projected Dates		Form of Implementation of Work	Form of Cooperation
			USSR	USA	Begin	End		
1	2	3	4	5	6	7	8	9
		3. Comparison of mathematical models with experimental results and its use for forecasting results when applied to large ESR ingots.	Paton Institute (Prof. B. I. Medovar, Dr. Yu. A. Sterenbogen) Glavspetsstal of Ministry of Ferrous Metallurgy, USSR (Moscow)	Prof. M. C. Flemings, Prof. J. Szekely, Dr. Klein	1974	1976		
3.	Development of furnaces for electroslag remelting with automatic systems control based on computers		Paton Institute, (Prof. B. I. Medovar	Dr. S. G. Fletcher, Senior V.P., American Iron and Steel Inst Institute	1975			Exploratory discussions between directly interested parties to develop possible forms of mutual cooperation and development of equipment

N. E. Promisel

Chairman of the U.S. side of the Joint U.S.-U.S.S.R. Working Group on Electrometallurgy
N. E. Promisel

Chairman of the Soviet side of the Joint U.S.S.R.-U.S. Working Group on Electrometallurgy
Dr. of Technical Sciences
S. Antonov

UNCLASSIFIED

UNCLASSIFIED

Of the USA-USSR Scientific-Technical Cooperative Research in the Field of "Plasma Melting of Metallic Materials"

Appendix 6

No.	Project Titles	Contents of Projects	Cooperating Organizations: USA	Cooperating Organizations: USSR	Projected Dates: Start	Projected Dates: End	Form of Completion	Forms of Collaboration
1	2	3	4	5	6	7	8	9
I.	High temperature interactions between gases and liquid metals	1. Studies of nitrogen solubility in liquid metals over broad temperature range	Univ. Michigan (Prof. R. Pehlke)	Ye.O. Paton Institute for Electrowelding (Prof. V. I. Lakomsky)	1974	1976	Tables, graphs, nomograms, joint publications	1. Research on mutually agreed projects: named investigators to develop detail. 2. Joint seminars 3. Exchange of research trainees 4. Exchange of specimens, materials, information, and experimental methodologies.
		a. Solubility of nitrogen in iron, nickel, manganese, chromium	Stanford Univ. (Prof. N. Parlee)	Baikov Institute for Metallurgy (Dr. V. I. Kashin)				
		b. Solubility of nitrogen in binary, iron-base, alloys		Bardin Institute (Prof. A. G. Shalimov)				
		c. Solubility of nitrogen in multicomponent alloys						
		2. Investigation of interaction of nitrogen with liquid metals in plasma melting	Battelle Columbus Institute (Dr. F. Holden) MIT (Prof. T. B. King)	"	1974	1976	"	"
II.	High-nitrogen steels	1. Technology of preparation of low-nitrogen alloy electrodes for plasma remelting	Temescal (Dr. R. Hill)	Ye. O. Paton Institute for Electrowelding (Prof. V. I. Lakomsky)	1974	1976	"	"

UNCLASSIFIED

UNCLASSIFIED

1	2	3	4	5	6	7	8	9
		2. Investigation of the nitrogen alloying process in plasma remelting of steel, to determine optimum parameters	Battelle-Columbus Institute (Dr. F. Holden)	Bardin Institute (Prof. V. I. Shalimov) Dneprospecstal (Dr. K. S. Yeltsev)	1974	1976	"	"
		3. Determination of optimum parameters in deformation and thermomechanical processing of high nitrogen steels	Allegheny-Ludlum Battelle-Columbus Institute (Dr. F. Holden)	"	"	"	"	"

N. E. Promisel

Chairman of the U.S. side of the Joint U.S.-U.S.S.R. Working Group on Electrometallurgy
N. E. Promisel

Chairman of the Soviet side of the Joint U.S.S.R.-U.S. Working Group on Electrometallurgy
Dr. of Technical Sciences
S. Antonov

PROGRAM

SOVIET-AMERICAN SCIENTIFIC AND TECHNICAL COLLABORATION IN SUBJECT OF THE "ELECTRONBEAM EVAPORATION OF METALLIC and Non-Metallic MATERIALS IN VACUUM"

Appendix 7

No.	PROJECT TITLES	CONTENT OF PROJECTS	COLLABORATING ORGANIZATIONS from USSR	from USA	PROJECTED DATES start	end	FORM OF COMPLETION	FORMS OF COLLABORATION FOR ALL PROJECTS
1	2	3	4	5	6	7	8	9
1.	Investigation of the structure, composition of sections and of some properties of the vacuum condensates on the basis of the refractory carbides, borides and some oxides.	Investigation of the structure and physico-mechanical properties of condensates. Selection of the optimum compounds. Technology development of building up the coatings of optimum compositon on surface of the cutting tool of refractory tungsten compounds and high-speed steel. Development of chemical analysis methods for coatings.	1) E. O. Paton Institute of Electrical Welding (prof. B. A. Movchan, Dr. A. V. Demchishin) 2) Kiev State U. (prof. A. T. Pilipenko)	UCLA (Dr. Bunshah) Temescal (Dr. Hill) Carnegie-Mellon (Prof. C. Bauer Prof. R. Heckel)	1974	1976	Joint article, reports Any questions of patents will be discussed at a later date, to be based on instructions of the Joint Commission.	1) The carrying out of the research independently by each side 2) Mutual exchange of method and procedures, materials, and samples 3) The exchange of research trainees. 4) Joint seminars and meetings for discussion of results.
2.	Investigation of efficiency of the cutting tool with coatings.	Selection of general method of investigation of the cutting tool efficiency. Preparation of the experimental lots of cutting tools of each contributor and reciprocal exchange of the tools with coatings. Comparative testing by each contributor of their own and obtained specimens of the cutting tools.	3) All-Union Scientific Research Instrumental Inst. (prof. Yu V. Tsvis)	Maniabs Inc. (Dr. Kaufman) Oregon Grad. Center (Dr. Rudy)	1975	1976	(As above)	(Same as above)
3.	Development of the laboratory and industrial electron beam units to build up coatings.	Development and approval of the diagrams of experimental electron beam assembly in order to build up coatings on cutting tools of the production capacity of 1-5	4) E.O. Paton Institute of Electrical Welding (prof. B. A. Movchan, L. V. Kovalenko)	AirCo Temescal (Dr. Hill)	1974	1976	Installation of experimental models of assemblies (already developed equipment can be used) Discussion of patent limitations will occur as work proceeds.	(Same as above)

UNCLASSIFIED

1	2	3	4	5	6	7	8	9
		million pieces a year. Development of the assembly project. Mutual preparation of two experimental models of the assembly for each of contributors. Development and testing of assemblies (installations).						

Chairman of the U.S. side of the Joint U.S.-U.S.S.R. Working Group on Electrometallurgy
N. E. Promisel N. E. Promisel

Chairman of the Soviet side of the Joint U.S.S.R.-U.S. Working Group on Electrometallurgy
Dr. of Technical Sciences
S. Antonov

UNCLASSIFIED

~~Program of U.S. Scientific and Technical Cooperation in the Field of Welding and Cryogenic Materials~~

Program of Soviet-American Scientific and Technical Cooperation
Research and Development of New Welding Materials

Appendix 8

No.	Project Title	Contents of Projects	Collaborating Organizations from USSR	Collaborating Organizations from USA	Projected Dates Start	Projected Dates End	Form of Completion	Forms of Collaboration For All Projects
1	2	3	4	5	6	7	8	9
I.	Investigation of welding materials developed both in USA and USSR	1. Preparation and exchange of welding materials representing the best available technology in the following materials: a. Electrodes of Type E7018, E9018 and E10018 and steels typical of those welded with these electrodes. σ_T - 50-55kg/mm^2 σ_{in} 60-65 kg/mm^2 σ_{in} 75-80 kg/mm^2 b. Wires and fluxes for automatic submerged arc welding of pipe for transmission pipe lines under shop conditions together with typical steels for such pipes. for ultimate tensile strengths of: - 50-55kg/mm^2(70-78ksi) - 60-65kg/mm^2(85-92ksi) - for use in artic applications c. Flux cored wires for semiautomatic welding of mild steel and low alloy constructional steels - rutile core for welding in CO_2	~~E~~.O.Paton Welding Institute (Prof. I.K. Pokhodnia, Prof. V. V. Podgaetsky, Dr. S. L. Mandelberg)	Rensselaer Polytechnic Institute (Dr. W. F. Savage Dr. E. F. Nippes) and Union Carbide Corporation	1974 1974	1976 Mid 1975	Preparation of materials: Reports on investigation results. Joint articles in scientific journals of both countries.	Carrying out of bilateral investigations on programs agreed upon, exchange of young scientists, joint publications of results of investigations in scientific journals of both countries carrying out of joint scientific seminars and symposia.

UNCLASSIFIED

1	2	3	4	5	6	7	8	9
		- basic core for welding in CO_2 - self-shielded wires for welding in flat position - all-position self-shielded						
		2. Preparation, exchange and agreement upon the procedures and welding conditions to be used by each party to evaluate the following properties and characteristics: a. Deposition characteristics and bead shape b. Ease of slag removal c. Susceptibility to hot cracking d. Susceptibility to cold cracking where pertinent e. Mechanical properties and notch toughness of as-deposited and stress-relieved weldments f. Evaluation of hygienic properties			1974	end 1974		
		3. Perform tests according to the program agreed.			1975	1976		
		4. Preparation and exchange of reports and joint discussion of results of investigation			1976	1976		
II.	Development of computational methods for predictive control of weldment properties	1. Preparation and sending of proposals on compositions of experimental welding materials, welding	E. O. Paton Institute Prof. I. K. Pokhodnia		1974	1974	(same as above)	(same as above)

UNCLASSIFIED

1	2	3	4	5	6	7	8	9
		conditions, and composition of base metal - electrodes of type E7018 - electrodes of type E7014 - austenitic stainless steel wires for welding cryogenic structures	Dr. K. A. Yushchenko Dr. O. G. Kasatkiv		1974	1977		
	2.	Preparation and sending of computer programs		IITRI R. E. Beale F. C. Bock	1974	March 1975		
	3.	Discussion and agreement upon overall program of investigation	E. O. Paton Institute (same as above)	IITRI (same as above)	1975	June 1975		
	4.	Manufacture experimental welding materials--electrodes and wires. Selection and procurement of 5-6 candidate austenitic steels for study from compositions proposed in (1)	E. O. Paton Institute Prof. I. K. Pokhodnia Dr. K. A. Yushchenko	IITRI (same as above)				
	5.	Exchange of welding materials and base metals	E. O. Paton Institute (same as above)	IITRI R. E. Beale				
	6.	Carry out welding investigations according to the agreed upon program in organizations of both countries	E. O. Paton Institute (same as above)	IITRI R. E. Beale	1975	June 1976		

Discussion and agreement of programs of investigation in June 1975 in Kiev at E.O. Paton Inst. - 2 persons will participate from the American Side for 1 week

1	2	3	4	5	6	7	8	9
		7. Processing of results of welding investigations on computers at IITRI - one welding expert and one mathematician from E. O. Paton to cooperate in this phase of the program at IITRI		IITRI R. E. Beale F. C. Bock with representatives from E. O. Paton Institute two persons for two months maximum	1976	1976		
		8. Preparation, exchange of reports and joint discussion of results of investigation	E. O. Paton Institute Prof. I. K. Pokhodnia	IITRI R. E. Beale	1976	March 1977		
III.	Investigation of mechanical properties of cryogenic materials and their welds	1. Preparation and exchange of lists of candidate cryogenic base materials and welding materials - stainless steels, iron nickel alloys, and aluminum alloys	E. O. Paton Welding Inst. Dr. K. A. Yushchenko Institute of Problems of Materials Strengths Dr. N. V. Novikov	National Bureau of Standards R. P. Reed Lehigh Univ. Prof. R. Stout	1974	1976		
					1974	1974		
					1974	1975		
		2. Agreement upon candidate base materials and welding materials for study, procurement and exchange of these materials						
		3. Evaluation of these cryogenic materials utilizing such tests as fracture toughness, fatigue crack, impact, and tensile properties over an appropriate temperature range down to minus 296°C.			1974	1976		

Discussion of results of investigations in the first half of 1977 in Chicago at IITRI - 2 persons will participate from the Soviet Side for 1 week

UNCLASSIFIED

1	2	3	4	5	6	7	8	9
		4. Preparation exchange of re reports and joint dis-u cussion of results of investigation			1976	1976		Discussion of Results of Investigation in National Bureau of Standards in Boulder Colorado - 3 persons from the Soviet side will participate for 1 week

Chairman of the U.S. side of the Joint U.S.-U.S.S.R. Working Group on Electrometallurgy
N. E. Promisel N E Promisel

Chairman of the Soviet side of the Joint U.S.S.R.-U.S. Working Group on Electrometallurgy
Dr. of Technical Sciences
S. Antonov

UNCLASSIFIED

SOLID STATE JOINING OF MATERIALS

The topic is directed toward investigation of physical processes at the interface region when composite materials are fabricated, diffusion welding, and fabrication of bimetallic materials. Research in the following areas is envisioned:

a. surface preparation and diffusion processes,

b. chemical composition and structure at the joint and adjacent regions,

c. adhesion of layers,

d. mathematical modeling of processes occurring during formation of joints.